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United States Patent [19][11] **Patent Number:** **5,485,551****Ejima et al.**[45] **Date of Patent:** **Jan. 16, 1996**[54] **FUZZY INFERENCE DEVICE**[75] Inventors: **Hideji Ejima, Kyoto; Taiji Yoshikawa, Nagaokakyo, both of Japan**[73] Assignee: **Omron Corporation, Kyoto, Japan**[21] Appl. No.: **736,635**[22] Filed: **Jul. 26, 1991**[30] **Foreign Application Priority Data**

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[51] **Int. Cl.⁶** **G05B 13/00**[52] **U.S. Cl.** **395/61; 395/76; 395/900**[58] **Field of Search** **395/900, 61, 76, 395/51**[56] **References Cited****U.S. PATENT DOCUMENTS**

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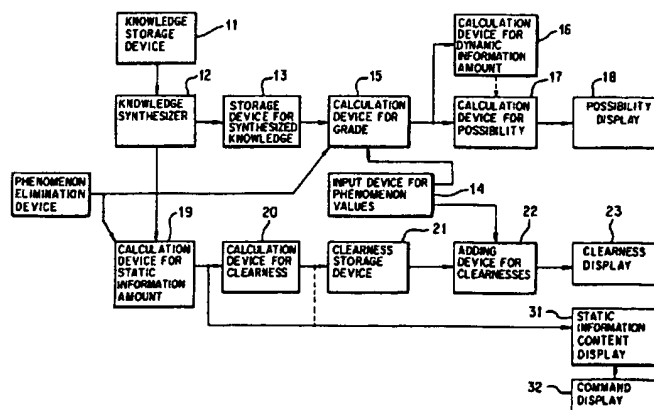
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[57]

ABSTRACT

The knowledge of an expert user expressing the relationships between phenomena and a conclusion (a rule) is stored prior to the use of the device. Input data are applied to this knowledge in order to make an inference. The possibility of the conclusion is calculated, and the clearness of each phenomenon relative to the possibility of each conclusion is determined by the fuzzy inference device. The phenomena related to a single conclusion which have low static information amount or clearness are selectively eliminated. In this way the rule can be adjusted, the processing time can be reduced, and the reliability of the conclusion can be improved. In second and third embodiments of the invention, the knowledge of an expert user expressing the relationships between phenomena and conclusions (rules) is stored prior to the use of the device. Inferences are made by applying input data to this knowledge. The possibilities of conclusions are calculated; the clearness of each phenomenon relative to the calculated possibility of each conclusion is determined; and the summed clearness of each conclusion is calculated by the fuzzy inference device. Guidance is provided to select which phenomena to input in order to maximize the sum of the clearnesses. The phenomena data selected by this guidance system can be input by a human or by an automatic means.

29 Claims, 13 Drawing Sheets

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DOCUMENT-IDENTIFIER: US 5485551 A

TITLE: Fuzzy inference device

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INVENTOR-INFORMATION:

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US-CL-CURRENT: 706/52, 706/60 , 706/900

ABSTRACT:

The knowledge of an expert user expressing the relationships between phenomena and a conclusion (a rule) is stored prior to the use of the device. Input data are applied to this knowledge in order to make an inference. The possibility of the conclusion is calculated, and the clearness of each phenomenon relative to the possibility of each conclusion is determined by the fuzzy inference device. The phenomena related to a single conclusion which have low static information amount or clearness are selectively eliminated. In this way the rule can be adjusted, the processing time can be reduced, and the reliability of the conclusion can be improved. In second and third embodiments of the invention, the knowledge of an expert user expressing the relationships between phenomena and conclusions (rules) is stored prior to the use of the device. Inferences are made by applying input data to this knowledge. The possibilities of conclusions are calculated; the clearness of each phenomenon relative to the calculated possibility of each conclusion is determined; and the summed clearness of each conclusion is calculated by the fuzzy inference device. Guidance is provided to select which phenomena to input in order to maximize the sum of the clearnesses. The phenomena data selected by this guidance system can be input by a human or by an automatic means.

29 Claims, 21 Drawing figures

Exemplary Claim Number: 10

Number of Drawing Sheets: 13

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Detailed Description Text - DETX (71):

When one or more phenomena to be eliminated from consideration for a given conclusion are input via device 33, the possibilities and clearnesses are recalculated. That is, data expressing the phenomena to be eliminated are sent to the calculation device 15, which calculates grade. The operations which this device would perform to determine the grade of the eliminated phenomena to the membership function for the conclusion are eliminated. Similarly, the input data for the eliminated phenomena are not included in the calculations

performed by device 17 to determine possibility. What is meant, then, by the elimination of phenomena is that these phenomena are removed from the rules expressing the expert knowledge. The possibilities are recalculated according to the new rule, from which the phenomena input by device 33 have been eliminated from consideration for the given conclusion. The new possibilities are then displayed on display 18. With this scheme, the user is able to judge whether or not it was appropriate to remove those phenomena from consideration.

Detailed Description Text - DETX (73):

The static information amounts are displayed, a command is input specifying which data to remove, and the various calculations are redone in accordance with the new rules from which the unwanted phenomena have been eliminated. This sequence is performed repeatedly by changing the conclusion number j until all of the conclusions have been processed. Finally, all the rules related to conclusions will have assumed a simpler form.